Single Coronary Artery

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Recommended Citation
Jingxuan, Guo; Jieming, Mao; Weidong, Yan; Changjiang, Liu; and Mingzhe, Chen (1990) "Single Coronary Artery," Henry Ford Hospital Medical Journal: Vol. 38 : No. 1 , 85-86.
Available at: https://scholarlycommons.henryford.com/hfhmedjournal/vol38/iss1/22

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Single coronary artery is an uncommon congenital deformity, and no case of this abnormality has been documented heretofore in China. Of 160 patients who underwent coronary angiography, only one case of the single coronary artery deformity was discovered. Following is a report of the case.

**Case Report**

In 1987, a 44-year-old male was examined because of chest distress and shortness of breath after exertion present for three years. The patient had good health otherwise. Three years previously, in the absence of any known provocative factor, the patient began to experience precordial discomfort after exertion, but he denied having chest pain or paroxysms of dyspnea. He had no history of cyanosis, palpitations, or edema but reported a five-year history of high blood pressure. With the irregular use of antihypertensive agents, the blood pressure had fluctuated between 140/90 and 160/95 mm Hg. He had no history of diabetes or hyperlipidemia, neither smoked nor drank alcohol, and had no family history of genetic disease.

On physical examination the patient was found to have good general health and normal growth and nutrition. No cyanosis or clubbing of the fingers was found. The thorax was symmetrical, and respiratory sounds were normal. The precordial apical beat was within the left mid-clavicular line of the fifth intercostal space and the heart rate was 72 beats/min. The aortic second sound was louder than that of the second pulmonic sound. Auscultation revealed no murmurs or other abnormal heart sounds. Blood pressure was 140/90 mm Hg. The liver and spleen were not enlarged and the lower extremities were normal. Electrocardiogram (ECG) revealed T-wave depression in leads avF, V₆, and V₅. Chest x-ray was normal, and the ratio of the cardiac diameter to the chest was < 0.5. Echocardiogram was normal.

Selective coronary angiography disclosed that the left main artery and the left anterior descending artery were normal. The circumflex and obtuse marginal arteries were well developed. As the left circumflex artery crossed the crux, it gradually developed into the right coronary artery and gave off the acute marginal and sinus arteries, respectively (Figs 1 and 2).

Despite using Judkins’ technique (1) with repeated change of angle and different types of catheters to perform the angiography, no orifice of the right coronary artery was found. After two trials, angiography of the ascending aorta showed the left main, left anterior descending, and circumflex artery, but the right coronary artery was not visualized (Fig 3). Left ventriculography revealed that segmental movement was normal, left ventricular ejection fraction was 62%, and left ventricular end-diastolic pressure was 15 mm Hg.

**Discussion**

Normally, the left and right coronary arteries arise from the left and right Valsalva sinus of the aortic trunk, respectively. By definition, single coronary artery arises from the aortic trunk by a single coronary ostium and supplies the entire heart through its distribution. In 1903 Bronchi was the first to discover and describe this abnormality (2). In a summary of 142 cases of single coronary artery, Ogden and Goodyer (3) found the male to female ratio to be 1.4:1. In 49% of the cases, the single artery arose from the left Valsalva sinus, while 45% arose from the right Valsalva sinus. A total of 68% of patients below age 20 years were found to have other cardiac or great vessel abnormalities, whereas only 6% of patients above 20 years of age had other abnormalities. Commonly occurring concomitant abnormalities were transposition of the great arteries, tetralogy of Fallot, coronary fistula, and bicuspid aortic valves (3). In the present case, no such abnormalities were discovered.

After arising from the Valsalva sinus the single coronary artery can either give off two or three branches or remain unbranched. Depending on the site of its origin and its anatomical

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Submitted for publication: October 12, 1989.
Accepted for publication: December 22, 1989.
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distribution, the single coronary artery has different angiographic manifestations (2-4). In our case, the left main artery arises from the left Valsalva sinus and gives off the left anterior descending and left circumflex branches. The left circumflex coronary artery continues beyond the crux as the right coronary artery. This distribution of the coronary arterial tree is rarely reported.

Patients with a single coronary artery may have no symptoms, and, being compatible with longevity, the condition is difficult to diagnose. Most reported cases are discovered during autopsy. In living patients, angiography is the only means of reliable diagnosis. When the orifice of one coronary artery is not found during selective coronary arteriography despite repeated changes of position and direction of the catheters, the possibility of the single coronary artery abnormality must be considered. In this circumstance supravalvular aortogram should be diagnostic. Congenital absence of an orifice for one coronary artery must be differentiated from total occlusion of the artery by atherosclerosis or thrombosis and from hypoplasia of one major coronary artery with a very dominant left system.

Prognosis for patients with a single coronary artery varies from excellent, with no decrease in life expectancy, to the occurrence of sudden death. In the absence of other congenital heart disease, a single coronary artery may produce neither cardiac disability nor a decreased life expectancy. However, displacement of an ostium may not be benign but predispose to accelerated atherosclerosis, with resultant cardiac ischemia or acute myocardial infarction (4,5). Single coronary artery may also cause angina if a relatively small proximal vessel becomes diseased or may make distal coronary arterial lesions, which are usually hemodynamically insignificant, reduce coronary blood flow. Furthermore, if the trunk of the single coronary artery or its branches lie posterior to the pulmonary artery (between the aorta and pulmonary artery), mechanical compression exerted by the great vessels can result in cardiac ischemia or even in sudden death. Our patient presented with shortness of breath, chest discomfort, and T-wave inversion in the ECG, but angiography revealed no constriction or obstructive changes. Further observations may reveal the significance of the symptoms.

A limited number of patients with single coronary artery have been treated surgically by bypass grafting to the distal arteries, despite that the distal anatomy of the coronary artery in most cases is normal. The usual management of ischemic symptoms is similar to that of coronary artery disease.

References